Summary Slide

- Experimental Design
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- Checking the Design
- Generating Experiment Ideas

Experimental Design

Hypothesis

- Educated guess about what will happen
- If…. Then…

Independent Variable

- The part that is *purposely* changed
- What will you do/add/change?

Dependent Variable

- The variable that responds to change.
- What happened?

Trials

- Number of times the experiment is done
- Are the results accurate?
- Did you try the experiment enough times?

Constant

- Factors that do not change
- What was kept the same through each trial?

Control

- Used to detect and measure any effects of unknown factors.
- How do we know the independent variable is responsible for the change?

Parts of the design

- Hypothesis
- Independent variable
- Dependent variable
- Trials
- Constant
- Control

Experimental Design Diagrams

Organizing your design

Diagrams

Title: The Effect of …On….

Hypothesis: If ..., then ...

IV: Independent Variable			
0 Scoops (control)	1 Scoop	2 Scoops	3 Scoops
3 trials	3 trials	3 trials	3 trials

DV: Dependent Variable

C: Constants

- STEP 1: Write a title

"The Effect of (the Independent Variable)
on (the Dependent Variable)"

↓

"The Effect of Various Amounts of Calcium Chloride
on the Temperature of Water"

- STEP 2: State a hypothesis

“If the (independent variable) is (describe how you changed it), then the (dependent variable) will (describe the effect)”

↓

“If more scoops of Calcium Chloride are added to water, then the temperature of the water will increase.

- STEP 3: Draw a table with three rows

- STEP 4: Write your independent variable (IV:)

IV:

- STEP 5: Divide bottom rows into columns
  - one column for each level of the independent variable

IV: Independent Variable			
0 Scoops (control)	1 Scoop	2 Scoops	3 Scoops
3 trials	3 trials	3 trials	3 trials

  - Write the levels of the IV in the columns
  - Label the control
  - Write the number of each trials for each level

- STEP 6: Write the dependent variable (DV:) under the table

- STEP 7: Write a list of Constants (C:)

Example Diagram

Title: The Effect of Various Amounts of Calcium Chloride on the Temperature of Water

Hypothesis: If more calcium chloride is added to water, then the temperature of the water will increase.

IV: Independent Variable			
0 Scoops (control)	1 Scoop	2 Scoops	3 Scoops
3 trials	3 trials	3 trials	3 trials

DV: Temperature of Water

C: Same amount of water (75 mL)
Same time to dissolve (2 min)
Constant stirring

Checking the Design

Looking for ways to improve your experimental design

Checking the Design

- Does the title identify both the independent and dependent variables?
- Does the hypothesis clearly state how you think changing the independent variable will affect the dependent variable?
- Is there an independent variable?
- Are the levels of the independent variable clearly stated? Are there enough levels?

Checking the Design (cont'd)

- Is there a control? Is it clearly stated?
- Are there repeated trials? Are there enough of them?
  - Non-living, less variety, fewer trials needed
  - Living, lots of variety, many trials needed
- Is the dependent variable clearly identified and stated?

Checking the Design (cont'd)

- Is the dependent variable operationally defined?
  – How will it be measured?

Checking the Design (cont’d)

- Are the variables operationally defined?
  - How will they be measured?
- Are the constants clearly defined and described? Are there any others?

Generating Experiment Ideas

4 Question Strategy

Question 1

- What materials are readily available for conducting experiments on (topic)?

Question 2

- How do (topic) act?

Question 3

- How can I change the set of (topic) materials to affect the action?

Question 4

- How can I measure or describe the response of (topic) to the change?